

PHASE TRANSFORMATIONS IN Fe(10 μm) – Ti(2 μm) LAMINAR SYSTEM AT ISOHERMAL ANNEALINGS

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To study thermally induced diffusion and phase formation processes in α -iron with titanium coating during successive stages of thermal annealing we used Mössbauer spectroscopy and X-ray diffraction. The layered system Fe(10 μm)–Ti(2 μm) was obtained by ion-plasma Ti deposition on α -Fe foil. Successive stages of thermal annealing were made in vacuum $1 \cdot 10^{-6}$ mm Hg at temperature 700°C. Mössbauer measurements were carried out on spectrometer MS1104Em in transmission geometry with $^{57}\text{Co}(\text{Cr})$ source. For spectra processing and analyzing we used the method which enables to reconstruct the distribution function of hyperfine parameters of partial spectra realized in software MSTools. X-ray diagrams were obtained on diffractometer BRUKER D8 in Cu-K $_{\alpha}$ radiation on both sides of the sample. Relative intensities of partial Mössbauer spectra (Fig.1) of formed phases, relative intensities of corresponding diffraction reflexes (Fig. 2) and titanium concentration in α -Fe(Ti) solid solution were determined at each annealing stage.

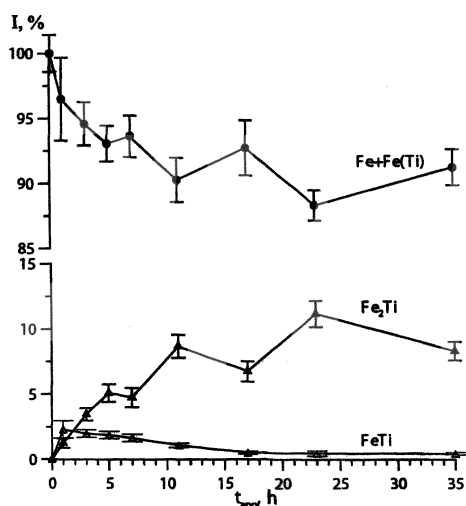


Figure 1- Relative intensities of partial Mössbauer spectra of formed phases as a function of time of isothermal annealing.

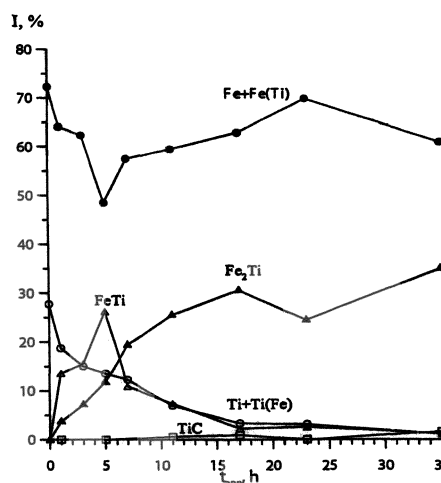


Figure 2- Relative intensities of diffraction reflexes of formed phases as a function of time of isothermal annealing.

As seen from Fig. 1 and Fig. 2 before annealing the sample had two phases – α -Fe and α -Ti. The process of phase transformations starts with formation of intermetallide FeTi enriched in titanium and oversaturated solid solution with α -Ti(Fe). Further annealing causes decay of FeTi phase and formation of intermetallide Fe $_2$ Ti. Increase in the annealing time from 17 to 35 hours did not cause considerable changes in the phase composition of the sample. Thus, at a temperature of 700°C stable in time layered system presented on the coating side by the intermetallide Fe $_2$ Ti and on the substrate side by the solid solution α -Fe(Ti) with titanium concentration ~ 0.5 at.% was obtained.